Study of the Interfacial Region between New Proton Exchange Polymers (PEM) and Pt Catalyst in a Gas Diffusion Electrode

T. Navessin and S. Holdcroft
Simon Fraser University
Department of Chemistry
Burnaby, B.C., Canada V5A 1S6

The membrane/electrode interfaces is crucially important for successful fuel cell operations. It is well known that only electrocatalyst particles located in these regions are electrochemically active. In order to study the electrochemistry of this region and correlate ex-situ electrochemical characterisations to in-situ fuel cell measurement, the “half-cell” method, which is an ex-situ measurement that closely simulates fuel cell conditions, has been developed.

The half-cell technique allows the electrochemistry at the membrane/electrode interface to be studied under minimal artifacts, which are otherwise imposed upon by the fuel cell system and design. In addition, the technique may allow pre-screening of membrane and catalyst materials prior to the fuel cell testing.

The O_2 reduction at Pt-on-C sites located at the interface exhibited kinetic behaviour similar to that of bulk Pt. The mass transport characteristics were dependent on the structure of membrane and the electrode. The polarization response was enhanced when the interfacial region was extended.

The study of the electrochemistry at the membrane/electrode interface can provide valuable information, which can be used to develop more efficient membrane electrode assembly.

ACKNOWLEDGEMENTS

Special thanks to B. Canning and H. Van Der Wal for helpful discussions. Thanks to Simon Fraser University for financial support.